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Journal of the Society of Arts.

FRIDAY, OCTOBER 9, 1863.

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THE LATE WILLIAM TOOKE, PRESIDENT OF THE SOCIETY.

A letter from Mr. Arthur Tooke, announcing the death of his father, having been laid before the Council specially summoned, the following resolution was unanimously passed, and the Secretary was instructed to communicate it to the family of the deceased:—

The Council having learnt, with deep regret, the death of William Tooke, Esq., the President of the Society, desire to record their high sense of the valuable services he rendered to the Society during the long period of 61 years, and to express their condolence with Arthur Tooke, Esq., his son, and the other members of his family, on the loss which they have sustained.

THE IRON TRADE OF BELGIUM.

The following account of the Iron Trade of Belgium appears in the official report by Her Majesty's Secretary of Legation at Brussels:—

Iron ore is found in abundance in every province of Belgium, but principally in Namur, Hainaut, Liege, and Luxembourg—the four mining provinces. That found in the five Northern Provinces is all so-called "alluvial" ore found on the surface, and not in subterranean mines. The following are the three main varieties of ore raised in Belgium.

Pyrites, a combination of sulphur and iron, long treated by the Custom-house solely as iron ore, and as such prohibited from export, by an erroneous interpretation of the tariff. It is now recognised to be worthless for its ferruginous constituents, but is much demanded, and exported in large quantities to France and England, for the purpose of making sulphuric acid.

Oligist ore is a red oxyde of iron, generally impregnated with phosphorus in such large proportions as to yield a pig iron too brittle for refining purposes. It used to be quite neglected until M. Behr, the director of the Ongrée Iron Works, in conjunction with M. Montefiore Levi, discovered a means of utilising it by mixing it in the furnace with a flux composed of carboniferous schist mixed with limestone. Thus oligist becomes available in the furnace in combination with yellow ore in the proportion of 60 per 100, and even alone. This Belgian invention has tended to reduce the price, and also the general quality of the metal. The prices of oligist ore vary from 6 to 15 francs per ton.

The third description is hydrated or yellow ore, and includes a great many varieties, of which the brown hematite is the best. Hydrated ore is only used for the best iron. Some rich seams of it are found in Belgium, especially at Athus, and Ruette in Luxembourg, and at Morialmé Fraire, Acoz, Ligny, Jamiolle, Tres Gomezée, Bois des Minières, and Courin, nearly all in the province of Namur. These are ores of the first quality, and give a yield of 40 per cent. in the furnace. This description of ore is still prohibited from export, excepting to France and the Grand Duchy of Luxembourg.

Since 1830, great anarchy has crept into the administration of the iron mines. The organic law of 1810 lays down the principles by which they are still nominally governed. All deposits of iron ores in subterranean veins or strata are by that law classified under the head of mines, and are not to be worked without a concession emanating from the Crown. All superficial or alluvial beds of ore are classified as "minières," and may be worked by the owner of the land, on simply serving a declaration to that effect on the provincial authorities. This legal distinction is now generally evaded. The great bulk of the iron produce is now raised from the so-called "free iron mines," *i.e.*, mines not legally conceded. Only 20 mines are provided with concessions; all the others, nearly 2,000 in number, situated in 109 different communes of the four mining provinces alone, are tolerated to exist without restriction or taxation, under the name of "minières," though most of them are subterraneous. The number of these pits in 1855 was 1,208, and the labourers employed in them were 5,271; the number of communes was 64. As the number of communes having such mines has increased since then to 109, it may be presumed that the number of pits and hands employed has risen in a similar proportion. This irregularity has led to an improvident working, and even to the total destruction by water of valuable mines. Every landlord is allowed to carry on his works in his own way, subject to the control of the inspectors only for the prevention of accidents to the workmen or to the houses on the surface. Some law on this subject is urgently called for, as the tribunals refuse to execute the ancient law, and no new concessions can be granted.

The principality of Liege and the county of Namur were two of the earliest seats of the iron manufacture, and even claim the invention of the art of manipulating iron by means of coal, as also of the high-blast furnace for producing pig-iron. The first of these is said to have been that of Marche-les-Dames, erected in 1340. The earliest furnaces on record were on the low Catalan principle, which yields at the first fusion malleable iron. The high-blast furnace and the art of casting were brought to great perfection at Liege as early as in the sixteenth century. Here, as in England, fruitless efforts were long made with a view of applying coal and coke to the production of crude iron. This great economical revolution was accomplished in England in 1730, but not till 1821 in Belgium.

One of the first coke-blast furnaces was established in 1823, at Seraing by Mr. John Cockerill. The extensive iron works at that place had been founded by him in 1817, with the assistance of the king. His Majesty even became a joint proprietor of them by purchasing, in 1825, the share belonging to Mr. Cockerill's brother. This factory was long without a rival on the Continent, both for its gigantic size and perfect internal economy. Mr. Cockerill showed no less genius in his financial than his mechanical combinations, and became one of the founders of the National Bank. Unfortunately his restless spirit impelled him to embark in a great number (no less than sixty) of other enterprises in distant countries, even in Surinam. The Belgian Revolution was the first event that checked his career. The new government claimed to succeed to the rights of King William, until Mr. Cockerill, by a great financial effort, made himself sole master of Seraing, and brought it to its highest pitch of prosperity in 1838. The National Bank having suspended payment in that year, Mr. Cockerill was obliged to adopt the same course. He died in 1840, leaving an untarnished reputation as a liberal employer of labour, a daring but honourable speculator, and a father of Belgian manufacturing industry. The Seraing works are now carried on by a flourishing "anonyme" company, under the name of "Société de John Cockerill," and still enjoy a European celebrity and custom. They include within the same area a coal-mine, six blast furnaces, an iron factory provided with every apparatus, a steel puddling-mill, and machine factory.

Belgium possessed in 1820 about fifty iron blast-furnaces adapted for charcoal, and not one for coke. Since then a great number of the latter have sprung up in the coal-basins of Liege and Charleroy. Numerous refining and cupola furnaces, as well as puddling, rolling, hammering, splitting, and wire mills, have been erected and provided with the best appliances. The wealth created by this metal alone was estimated at 81,000,000 francs in 1860, and the exports at 24,750,000 francs. Belgium does not possess, like Wales, beds of iron and coal overlying each other in the same mine, but possesses both minerals in close proximity to each other.

The number of smelting-furnaces in blast has fallen from sixty-six in 1857 to fifty-one in 1860, only one more than in 1820; but these fifty-one being all, with eight exceptions, adapted for coke, produced 319,943 tons of pig-iron, valued at 26,500,000 francs, probably four times the amount of the earlier period. Still these figures show a great falling off since 1857. There is still a small quantity of charcoal-iron produced in the province of Namur, valued at 128 francs per ton, or 50 per cent. above the average of coke-iron. Not a single charcoal furnace remains in blast in Luxembourg, though this province is the richest in forests and in good ores. A short summary of the fluctuations of the iron trade will be afforded by the following Tables:—

Comparative Statement of the Iron Furnaces and other Metal Works in Blast, and of the number of Hands employed therein, during the following Years:—

	Factories.			Workmen.		
	1851.	1857.	1860.	1851.	1857.	1860.
Iron smelting furnaces	46	66	51	3,067	4,423	4,078
Iron foundries	85	103	127	1,446	2,501	2,847
Iron works for manufacture of wrought iron	102	95	87	3,111	5,438	6,604
Iron works for elaboration of wrought iron	86	79	82	498	851	1,067
Steel works	...	2	4	...	250	275
Lead works	8	9	20	52	118	218
Copper works	19	15	11	122	282	206
Zinc works	19	20	23	1,947	2,750	3,019
Alum works	2	1	1	11	68	85
Glass works	39	47	45	2,644	5,652	6,194
Totals	405	437	451	12,898	22,333	24,593

Comparative Statement of the Prices, at Charleroy, of the Principal Descriptions of Iron, in January of the following Years, per Ton of 1,000 Kilogrammes, equal to 0·984 of an English Ton.

Description of Iron.	1851.	1855.	1857.	1860.	1861.	1862.
	Fr.	Fr.	Fr.	Fr.	Fr.	Fr.
Pig-iron, forge	70	110	110	90	77½	77½
Do. foundry, No. 1	115	150	160	112	105	110
Do. foundry, No. 5	125	150	120	90	125	125
Do. charcoal	125	175	...	155	125	125
Bar-iron, rolled, No. 1	140	210	220	165	155	160
Do. rolled, No. 2	170	230	240	185	175	180
Do. strong, No. 3	200	250	260	205	195	200
Rails and accessories	170	190	215	170	157½	157½
Split-iron, soft .... per ½ ton.	58	92	100	77	69	70
Do. for nails, medium ,,	66	100	110	86	75	76
Do. best strong ,,	74	108	120	94	81	82
Sheet-iron, 1st quality	280	350	370	260	230	230
Do. 2nd quality	270	340	340	250	220	220
Do. fine	330	410	380	290	270	280

The enormous increase in the produce of iron has not taken place without some sacrifice of quality. Bars and rails of the present day are not what they were even ten years ago. Belgian irons compete closely with our own in quality and price. In the former respect they are superior to our ordinary descriptions, which is attributed to the universal employment of coke in Belgian furnaces instead of coal, as is usual in England. The grey pig-irons generally used in England are certainly superior to the white irons used in Belgium, but they require a larger amount of puddling than the high price of labour generally enables them to receive; so that when turned out in that imperfect state they are inferior to white irons for refining purposes. Belgian bars may on an average be classed below those of Yorkshire, especially those of Lowmoor, on a par with Staffordshire, and above Welsh irons. Belgian foundry iron has more tenacity, but less ductility, than the English article, owing also to the use of coke.

Great improvements have been introduced in the manufacture of iron of late years, especially Calder's hot blast. A patent has been taken out by a Belgian engineer, M. Fromont, and generally introduced, whereby the hot blast can be intensified to a temperature of 500 degrees for making foundry iron. Some articles of wrought iron, such as wheel-tires without joints, and fish-joint bolts, can be made in Belgium more cheaply than in England; so that a British firm which has lately taken an extensive contract in Holland has ordered these accessories in Belgium. In rails, none can undersell the Welsh, but the Belgians compete successfully with them, owing to differences of quality in foreign markets. Thus, at a recent extensive adjudication in the South of France, a Hainaut firm obtained a contract for 12,000 tons of rails at 20 francs per ton higher than a tender submitted by a Welsh house.

Belgian sheet iron, particularly the best quality, called "tôles fines de commerce," is much esteemed in and much exported to France. Split iron is little used in France, but is still produced in Belgium in large quantities for the nail-makers, who prefer it on account of its cheapness to rod-iron. The nail manufacture is another Belgian staple, which has attained immense proportions: it offers the great advantage of being exercised in the workman's own house, at his own fire-side, and even in his own kitchen fire; it is the winter employment of thousands, who in spring migrate to France to make bricks. Belgian nails are exported to all parts of the world.

The exports of machinery have increased from 4,750,000 francs in 1851 to 13,000,000 francs in 1861; still complaints are made of insufficient profits, owing to the constant fall of prices in the rolling stock of railways. The French and German markets are completely closed against this branch of Belgian industry. The Russian demand is great and increasing. Italy, Spain, and Portugal take many locomotive engines annually. A fine specimen of this article, the work of the Couillet iron factory, was seen at the London Exhibition.

The history of the arms trade seems to be one of unbroken prosperity; the demand seems to be insatiable. The year 1860 already showed the largest export of small arms on record, but was surpassed in the proportion of 2 to 3 by its successor, which showed an export of 18,000,000 francs in value. All the muskets that could possibly be supplied have been hurried off to the United States, at a great pecuniary profit to Liege. This branch of industry has been also much benefited by orders for rifles executed for her Majesty's Government; these arms are subjected to unusually severe trials, and have thus been the means of raising the standard of quality of the higher class of Liege small-arms. The wages of labour in this trade have risen to an unprecedented height; nevertheless, some skilled mechanics formerly engaged on fowling-pieces of high finish have been out of work, or have been obliged to learn to make muskets. The Liege arms manufacture is principally carried on by the men in their own houses. The numbers of fire-arms tested at the Liege "banc d'épreuves," exclusive of those manufactured at the Royal foundry, were in 1859, 481,767; in 1860, 562,279.

The iron exports of all kinds have risen from 11,750,000 francs in 1851 to 25,000,000 francs in 1857 and 1860; the values for 1861 are not yet assessed, but the quantities show an increase on the whole, though a decrease in some articles, such as nails and rails. The export of pig-iron has receded since 1857, owing to the increase of duty in the Zollverein; but that of ores and wrought iron has been and is constantly progressing. The year 1861 has been one of depression, but not of total stagnation; prices have fallen back to the ruinous figures of 1847, and the profits of the blast furnaces have been little or nothing. The iron factories have done rather better, and have been fully employed, though at low rates.

The Belgian iron masters have shown themselves advocates of progress and free trade; they have declared themselves ready to meet English competition, though at present in possession of a virtual monopoly of the home trade. Some small quantities of Swedish pig-iron, and of English wire, steel, and hardware are imported. Every effort is made by this powerful industry to force a sale of its produce abroad. Four of the great Hainaut firms, those of Couillet, Monceau, Châtelineau, and Thyle-Château, have combined to form an "Union Sidérurgique" for the purpose of maintaining joint agents in foreign countries to canvass for orders. The shares and profits of all these undertakings have fallen to a low ebb. The last quotations show a slight reaction in prices; the firmness of the English market is acting on that of Belgium.

BRITISH ASSOCIATION, NEWCASTLE-ON-TYNE, 1863.

The following paper was read in Section G:—

On Rendering Vessels Comparatively Unsinkable, Facilitating the Stoppage of Shot-holes below Water, and Adapting our Present Vessels constructed of Timber for Effective Foreign Service.

By Admiral Sir Edward Belcher.

It has been so generally admitted that all complicated inventions are the result of some previous discovery, or the adaptation or taking advantage of the brains of others, whose ideas we have worked and sometimes improved upon, that one scarcely ventures in these days of challenge to assume that his faculties belong to himself. Indeed, we are indebted to former inventions for nine-tenths of the improved structures we now protect by patents, and it is a fact too well known that when we, as naval officers, give to the Government our ideas, that we lose our patent rights—receive no consideration in return, and frequently have the mortification of witnessing useful and valuable *bonâ fide* inventions slighted and thrown aside, at some future day to be modified and patented by others, and then patronised, because they are the patented offspring of civilians.

In the present instance I may say, not that I have modified the invention of a highly talented man, but that, urged by him in a career of invention, and aided by practical chemical pursuits, I adapted the well-known action of the pneumatic trough, not only for the purpose of rendering ships unsinkable, but for effecting the floating camel, now termed also, by change of the *modus operandi,* into a "Patent Hydraulic Slip." It is not my intention to discuss these matters now. Others have perfected them, and they derive the credit for successful perfection of inventions suffered to die by official ignorance.

In the year 1815, Mr. Walters, then architect to the India House, published a small pamphlet "On the Rendering Ships for Mercantile Purposes Unsinkable," and he proposed to effect his object by introducing copper cylinders between the timbers, the hold beams, and indeed every opening where cargo did not press, and he calculated that these displacements, or cells, would about compensate for difference of specific gravity between cargo, vessel and gear, so as to simply reduce her to the state of a water-logged craft, to save crew and vessel and such portions of cargo as might be secured in air-tight vessels.

The pneumatic trough then presented to my mind the propriety of close ceiling the holds, of under planking the hold beams, and saving those spaces between them for the stowage of light dry goods above that deck, which was generally lost, and placing loose planks (indeed, as we were in the habit of hatching many of our brigs of 386 tons, and under) as a temporary deck.

Now in the event of a dangerous leak, or even a large hole being stove in the bows or bottom of a ship, I proposed securing the hatches from beneath to hatches above, screwed firmly in opposition to each other, and filled in by pitch from the upper or open hatch.

Now, it will be apparent that if the ship was air-tight the water could only enter so long as the air was compressible, and by inverting the pump boxes, and rendering them air-pumps, the leak would not only be stopped, but, by the continued action of the air, the water would be expelled by the very orifice by which it entered. Therefore, the customary and continued labour and wear of the powers of the crew would not be required to such an extent, if at all, when once the necessary quantity of air had been forced in. And it is important here to comprehend the beautiful power afforded by the pneumatic principle of causing the air to be set free at the lowest point accessible, as in the pump well, and without further strain on the pump displacing the water.

Indeed, I proposed, in 1823-4, at Bermuda, where they were constructing naval docks without a rise of more than three feet of tide, to construct such a timber "camel" in compartments so that the crew of a ship should, by their lungs alone, lift their vessel out of water, repair her copper, replace her, and start on a fresh cruise in 48 hours or less. And on a late occasion, when I was consulted by Mr. Marryat, Chairman of the London Dock Company, as to the value of one of these lifting caissons, I proved to the parties, I hope satisfactorily, that by aid of a glass tube about three feet long, and half inch bore, I could, by my lungs, even at my age, effect the very same displacement which they obtained by machinery. But allow me to observe it was not with any object of proposing any such mode of action, but simply to prove that I was not only competent to give an opinion on the merits of the matter at issue, but that it was really a great great grandchild, the issue of my own brain.

All these matters now referred to were laid before my friends Sir Robert Seppings, Sir Byam Martin, Sir Henry Hotham, and Sir George Cockburn in 1818, with guns, rudders, anchors, &c., but I was too young to deserve attention, and Sir Robert Seppings declared that unless the vessel was built for the purpose she would blow up by the pressure.

But now we have arrived at the means, by the use of iron plates, of forming air-tight cellular vessels; and I hope to be able to show, that by pursuing my mode of construction, the vessel not only becomes very much less liable to injury by a ram, but, if carefully and scientifically fitted, she may be overrun by an adversary, come up the other side, and perhaps return the compliment.

I have used the term, "my mode of construction." I claim the introduction into the navy of the air-tight compartments. I was appointed, December, 1835 (at the instigation of Sir W. Symonds), to Chatham Dockyard to superintend the fitting of the *Erebus* and *Terror* for Arctic service, having fitted my former ship, the *Ætna,* under *carte blanche,* at Portsmouth, in 1830. Mr. Rice was foreman afloat under my direction, and Sir James Gordon, now living, can inform you that every plan of mine was carried out totally at variance with the views of that gentleman.

The *Terror* afterwards lost her sternpost, the after section filled, but she was brought to England, saved alone by that after water-tight compartment. Mr. Rice, however, received the credit, because he belonged as a civilian assistant to a yard having a principal builder.

But this idea of cellular construction did not first occur to me then. It had long been a pet scheme. I had witnessed the facility of having the bottom open by my constant visits to the lobster smacks, in 1815, off the coast of Cornwall. I had closely watched the great junks of China in 1827, where each merchant carries his venture in his own water-tight cell, and when adequate powers were intrusted to me in 1830, I determined—then deemed a new application, if not an invention—to "well out" any hole which might be made by striking on rocks, and thus care nothing for the aperture. And for this purpose Mr. Blake, foreman afloat, similarly attached to me as Mr. Rice was in 1835-6, had made for me elongated "bringing-to bolts," with extra washers, as well as screw and nut bolts, all of which bore his name, as did also the "patent fid," then constructed for my decked boats, from my drawings, as made for me at Halifax in 1822.

It may not be generally known to builders how I proposed acting, but had the plan been followed in H.M.S. *Raleigh*, that vessel could very easily have been saved to the navy.

The facility of working by screw bolts under water, is sufficiently known to those who have had to deal with such matters, but there are secrets in all trades, and without the tact, talent is at a discount.

It is simply necessary to estimate or compute the internal form with which every builder is conversant, the approximate curves of the position where the injury lies, and to construct (either separately as a trunk, or placed piece by piece around the aperture, adding tarred felt), such a walling as will confine the water within limits. This may be either screwed down piece by piece if the ship's bow is well up on sand, or rocks, or may be forced down and shored from the beams until the ship is pumped out, when the outer walling can be perfected. But there is this difficulty in dealing with screws, bolts, or augers, under water; you cannot drive or screw to any certain effect under water. But having the command of a forge you can put on additional lengths to your tools with breaking nicks, which will easily separate on the attempt to bend, and thus work out of water.

We will now come to the question of rendering our steamers less liable to be sent to the bottom by sudden influx of water, by shot holes, or by any ram force which may make large apertures.

My first ideas on this subject arose in 1852, when considering the effect of a nip by the ice. We were then at sea, and beyond the refitting demanded for any such change, but my resolution was formed, and complete drawings made, entirely upsetting all previous ideas of cabin accommodation and stowage—unnecessary now—in fact, the construction of a ship within a ship. The outer sectional compartments each independent *per se*, for coals or stores. The inner, the steam compartment and accommodation, if necessary, demanded for the crew. The internal oval form would secure the means of withstanding externally any compression. It would facilitate the delivery of coals from the bunkers, and if anyone of those bunkers was perforated, or stove, you possess the engine power to be exerted from within of expelling the water by forcing in air, making every such valve self-acting from the exterior.

Now, many of us are practically aware of the facility of working under water within the diving-bell, and we have only to view the operation of closing a shot-hole under water as a diving bell mode of proceeding, taking proper care to secure the compartment which is fractured for such an operation.

But if we look carefully to the question which would be involved in action, I think we have no reason to believe that any volume of water admitted, *pro tem.*, into coal-bunkers, secured as I have suggested, would prove of any importance, seeing that the loose coal-dust would, immediately on becoming wet, fall down and fill up the space. So that, in fact, we should only have the difference between the specific gravity of coal and that of water as the increment of weight. And supposing the coal to be solid, and water inadmissible, we should merely change the weight

From 64·4 sea-water
To... 79·15 sea-coal

14·75

So that, truly, by a perfect system of compartments, we should laugh at shot-holes or rams, in so far as the duration of an engagement was concerned.

Now, looking to our timber-built vessels, I see no difficulty, particularly if they are swift, and of the *Alabama* breed, to the adaptation of these interior steam chests. We know full well to what angle we can heel these vessels, to clean their copper. Indeed, instead of heeling, which is dangerous, I would advise inclining by purchase, either by another vessel or by rafts, which I have practised, and which does not interfere with stowage. We will say as far as 30 degrees inclination, and at the corresponding line of flotation there, I would propose a firm stringer of African oak, well covered with asphalt, dividing any iron-sheathing from the copper bottom, and thus retaining the smooth and clean copper for velocity.

Now, we should refer to the state of our navy about the year 1824. At that period we commenced the system of Sir H. Davy, for preserving the copper from incrustation by marine mollusca, keeping up galvanic action to such a degree that they could not affix themselves to the copper. The ship I served in (the *Blossom*) was, in 1824, so fitted, with iron plates under each fore and mizen channel, about three feet below water. She continued in the Pacific, from the Arctic Circle to the Equator, four years, or until October, 1829, and was generally very free from weeds, except on the iron protectors, which were very soon reduced to plumbago, brittle, scaling off, and carrying with the incrustation of oxide masses of weed. Now, surely, at the present day, we are sufficiently advanced in science to secure the iron from coming in contact with the copper sheathing. The copper will not suffer, and it will be merely the nearest iron to it which stands a chance of being vitiated by its proximity to a dangerous companion.

From this stringer upwards, the vessel may be plated sufficiently to withstand guns of small calibre, or to deflect long-range shells, but, I would urge, not higher than the same lines of immersion, on the inclination due to 30 degrees. We should thus possess a hull which would be nearly unsinkable, and on that structure we might determine, as experiment may dictate, to use either square or round towers, but the bases of any gun-platforms should be so far retained within the limit of inclination as to set at nought any chances of such an absurdity as Capt. Coles exhibits in the plates of his pamphlet, in his *Favorite*. And assuming that a ship of war is engaged to leeward, considering also that our guns are not calculated to elevate 15 degrees, I do not think his arguments fair upon his land opponent. Besides, I would ask, what scientific officer, who understood his work, would so absurdly throw away his shot, when the weather-roll might in a few minutes reverse the conditions, exposing the interior of his tower to the mercy of his opponent. We hope yet to see a more satisfactory proof than assertion that the rolling of a turret vessel will not be dangerous to herself.

I have my own ideas as to the pendulum, as to the balance weights we have employed to equipoise our barometer—as to the steady chronometer table and the adjustments of chronometer escapements, not forgetting the governor in our land steam engines; and I expect the result of trial will prove that by so far as the turret inclines from the perpendicular, so will its weight be transferred to the lee-side. If the power of the hull be of sufficient (or possess surplus) buoyancy, then a result not to be wished must be elicited, the quick opposite or rolling motion to windward also due to the pendulum.

It is on this principle that we wing up our ballast to prevent quick rolling, endangering the masts. If we accord to the central weight what is advanced, why do we not in a gale of wind secure the guns amidships? When the roll is slow, long, and very deep, we do reduce the counterpoise by running in and housing main deck guns. The proposition reads to me like overmasting or carrying the leverage too high up.

Instead of wood filling, I would suggest the introduction of asphalt refuse, tough, resisting, and uninflammable, even under red-hot iron bolts. The principles advocated here are, first, cubical division, or the tank compartment, and of sufficient strength to resist pressure if used on the diving-bell system.

Next, the separation of the internal oval space to contain the engines, boilers, &c., and this alone, if securely circled, would, even if riddled, suffice to keep the vessel afloat, indeed, not disable her in any manner from continuing the engagement, which is the simple desideratum, for, like the exhausted prize-fighter, rest may recover, as withdrawal from action would enable our vessel quickly to repair or obviate damages.

I have now submitted to you the means by which timber built vessels may be enabled to fight a fair action even against plated vessels; and, provided they possess velocity, may even come out of action victorious, for we can advance many instances where a pair even of heavy guns well served in a vessel judiciously handled, are more than a match for superiority in broadside force.

It now only remains for me to make a few closing observations on a system of moveable armour, which may be adapted as a further protection to these vessels—which may be carried to a foreign station, or long voyage, in the hold, and when war is declared may be put on as occasion may demand.

It is proposed simply to arm the sides, for the prevention of penetration, from 20 degrees below the water-line, by similar plates to those now in use.

At the water-line, to bring on a set of powerful stringers or mouldings 7 feet asunder, admitting of armour plates dropping in from above, adapted with shoulders, so that the insertion of the second series would virtually lock them in their places.

Such a disposition would permit of any wounded plate being easily replaced; of any portion or all being removed and stowed in the holds, or, in peace, landed at the dockyard on a foreign station.

But this mode of moveable armour offers this further advantage in stationary guard ships should defence be demanded at moorings, for it is palpable to the plainest understanding that another tier of guns or masked battery, *à fleur d'eau*, would be available on the lower deck even of a sea-going vessel compelled to stand action in port.

Lastly, as regards facing our sea batteries. I maintain that by surrounding the outer masonry with a proper cage or framework, dropping in cylinders of 10 or 12 inch iron, and filling the interior up to the masonry with earth or sand, we have a much more economical as well as efficient incasing than any masses of plating, which by their weight and concussion alone in action, would tend materially to assist in destroying the work they were intended to protect.

These observations are offered to the engineering body by one whose life has been passed in the active pursuit of ship-building, and, on several occasions, in superintendence of work in our public dockyards, indeed, of a positive workman for the last fifty years.

They result, too, from foreseeing many serious difficulties presenting themselves to the repairs of iron-plated ships, indeed, of the positive impossibility of meeting with adequate resources on board the fleet, or in any foreign British dockyard. The serious question is not how, or how fast to build, but where to secure the remedy for disaster.

Thanking you for your kindness in suffering me to occupy so much valuable time, I leave these knotty points for more skilled minds to digest.

SOUTH STAFFORDSHIRE ASSOCIATION FOR PROMOTING ADULT EDUCATION.

The fourth annual meeting and conference of the above Association was held on the 28th Septenber, at West Bromwich, under the presidency of Lord Lyttelton. The annual business meeting was held at twelve o'clock, at the rooms of the Christian Institute, High-street. There were present Sir Thomas Phillips, Vice-President of the Society of Arts; Mr. Sampson Lloyd, of Wednesbury; Mr. B. Blake, of Yorkshire; Rev. H. Solly, Secretary to the Working Men's Club Union, London; Rev. D. Melville, Vice-President of the Worcestershire Union of Institutes; Rev. Mr. Wall, Brewood; Rev. H. K. Sandford, and the following delegates:—Mr. Joseph Stokes and Mr. George Lewis, Dudley Mechanics' Institute; Messrs. Phillips and Mills, Wolverhampton Christian Institute; Mr. Jeffries, Stourbridge Associated Institute; Rev. H. Sherrard and Mr. J. W. Grier, Stourbridge Church of England Association; Messrs. Morris and Hicklin, Stourbridge Iron-works Institute; Mr. Thomas Wood and Mr. Coddington, the Lye Institute; Rev. George Wharton and Mr. Thomas Bolton, Kinver Improvement Society; Mr. H. Beckett and Mr. E. Hollier, Dudley Geological Society; Mr. C. Britten, Wednesbury Mechanics' Institute; Messrs. Chapell and J. C. Tildesley, Willenhall Literary Institute; Rev. J. Whewell and Mr. Murray, West Bromwich Christian Institute; Mr. F. Talbot, Messrs. Chance's Reading-room and Library; Rev. H. F. Newbolt and Mr. Edward Pugh, Bilston Institute; Rev. A. C. Hodd and Mr. John Hague, Bilston Working Men's Association; Mr. N. Beddall, Brierley-hill Working Men's Club; Mr. Hayward, Oldbury Literary and Discussion Society; Rev. J. H. Thompson, Cradley Literary and Scientific Society; Messrs. F. C. Horton, A. Jordan, and J. W. Grier, delegates from night schools. Revs. G. D. Boyle, Handsworth; C. W. Richards, Ettingshall; N. N. Solari, Ocker Hill; T. G. Simcox, Smethwick; Messrs. Sampson Lloyd, J. Solly, J. P. Hunt, George Thompson, &c., and Mr. J. A. Langford, of the Birmingham Working Men's Club, were also amongst those present.

The fourth annual report of the committee was read, and in it the committee congratulated the meeting upon the success of the operations during the past year. The object of the society was expressed in its title; but it was explained that as the committee did not regard education as being complete with the acquirement of information, such subjects as entertainments and systematic recreation for the people, the improvement of workmen's homes and the establishment of free libraries, local museums, and so forth, came very properly within the scope of the society's operations. The results of the operations of the society were to a considerable extent indirectly attained, and could therefore scarcely be fully estimated from the evidence afforded by bare statistics; but nevertheless, if the state of the classes and night schools three years ago was contrasted with what it was at present, it would be evident that a great advance had been made. The number of Institutions was nearly the same, but there was now much greater activity shown by managers, and much more real work done by them. Night schools and evening classes had increased in a remarkable manner, and were now more generally conducted in a systematic way, very often under professional teachers. The number of persons attending the examinations of the Association had also continued to increase each year. The proportion of working men belonging to the Institutions was now much greater, and in many places successful efforts were being made to provide special buildings for the purposes of Institution work. By returns received from seventeen Institutions, it appeared that the number of members in the societies was 2,296, and in nearly every case an increase was reported since last year. The number of books in the libraries of sixteen institutions was 11,363, and nine Institutions had 482 students in their various classes last winter. Those returns did not include several schools which paid the

Institution fee in order to be able to send candidates to the Society of Arts Examination. Eighty lectures were delivered during the year in connection with sixteen Institutions. The special features in the Institutions' work were this year numerous and important. A handsome and commodious building was in course of erection at Dudley, and would be completed in a few months. It contained on the ground floor a reading-room, club-room, library, laboratory, a public hall capable of accommodating a thousand people, and upstairs a minor lecture-room (to be used also as a night school-room), several class-rooms and a room for a museum, which would contain a collection of district minerals and fossil remains. The total cost of the building would be about £5,000. The managers had purchased at Willenhall a plot of ground, upon which a building comprising the usual rooms and a large public hall would be forthwith erected. The committee considered it of great importance that suitable and permanent accommodation should be provided for Institution work, and expressed their belief that many failures were caused by the meagre arrangements which were often thought good enough for members. In several places considerable attention had been paid to weekly entertainments of a varied and lively character, the charge for admission being generally about one penny. In every case these entertainments had been successful, and in some instances large sums of money had been realised. The programmes consisted of vocal and instrumental music, interspersed with readings from standard authors, addresses, and any special performances, in which amateurs could be induced to take part. These entertainments were exceedingly popular, especially with the working-classes; and since mere lectures were usually very poorly supported, and often resulted in loss to the Institutions, it seemed to the committee to be desirable that entertainments of the character of those first spoken of should be more extensively tried. The Wednesbury Mechanics' Institute, the Lye Institution, and the Bilston Working Men's Association, were the only Institutions that carried on these entertainments systematically. In Wolverhampton and Oldbury special committees did the work. The committee lamented that the attendance-lists of many of the classes showed little zeal on the part of the students; but alluded with satisfaction to the Wolverhampton Working Men's College as an establishment in which existed a spirit and unity that were very generally wanting in other Institutions. At Dudley, Stourbridge, and Wednesbury Mechanics' Institutions, and at West Bromwich Young Men's Christian Institute, elementary classes were held last winter. From the experience of the Dudley Institute, it appeared that fees of twopence and threepence per week, supplemented by a special annual subscription, were sufficient to secure the services of an efficient master, and two junior teachers, all paid. In Lancashire and Yorkshire elementary evening classes formed a general feature in the majority of Institutions, and were in most cases very nearly self-supporting; but in South Staffordshire there was a backwardness on the part of managers to make such classes a part of the regular Institute work.—The report contained some suggestions upon the subject of the management of night schools; and, upon the subject of science classes, said it was peculiarly desirable that their number should be increased in South Staffordshire, on account of the character of the prevailing industries of that district. There was every reason to believe that the number of such classes and of students would increase largely during the winter. In connection with this subject, the committee gladly noticed the establishment of a scientific society in the district, the object of the promoters being to popularise such branches of science as geology, botany, and chemistry. The subject of working men's clubs had occupied the attention of the committee. In January last they made arrangements for the secretary of the London Working Men's Club Union visiting various places in the district, in company with the Secretary to the Association, and meetings were accordingly held at Dudley, Stourbridge, West Bromwich, and Wolverhampton. Since that time, the Secretary had attended meetings on the same subject at Wednesbury, West Bromwich, Sedgley, Brierley-hill, and Pensnett, in all of which places working men's clubs were now in existence. The committee expressed their sense of the great assistance which the Central Club Union afforded in the organisation of working men's clubs. The number of candidates whose names were given in for night schools this year was 300, and of these 210 were afterwards examined at 12 centres. Eighty-eight candidates for the Society of Arts certificates, and 58 for the prizes offered by the Science and Art Department had also been examined. The increase of candidates since 1862 was 54. During this year the committee had undertaken the superintendence of the Cambridge local examinations, held at Wolverhampton, with a view of bringing all the educational work of South Staffordshire into one focus. In December last, 39 candidates were examined at Wolverhampton—four from the senior examination and thirty-five of the junior. In the list of successful candidates South Staffordshire maintained the same high position which it occupied the preceding year. Several were distinguished in the classes and in separate subjects; and the Prince Albert Memorial Scholarship, the highest honour connected with the examinations, was won by a scholar of this district. The report concluded with an expression of regret that the Rev. J. P. Norris and the Rev. H. R. Sandford, having left the district, the association was deprived of their valuable assistance. It was also said that "the circumstances under which the committee were deprived of the aid of the late Rev. Mr. Campbell, and the sad fate which befel both himself and family only a short time ago, invest with peculiar interest the remembrance of the kind and genial friend who so recently took an active part in the work of the association." From the treasurer's account it appeared that the total income of the association during the past year had been £226 4s. 6d., and the expenditure £230 9s. 8½d. The balance of £33 18s. 4d. due to the treasurer last year had since been reduced to £20 12s. 3d. The committee appealed to the public for aid to pay off this debt, and to defray current expenses. The report was approved.

The Rev. H. Solly said that the members of the London Institutes felt very grateful for the assistance given them by the South Staffordshire Association, and by Mr. Jones, the secretary.—The report of the Examiners and that of the Visitors were then read. From the former it appeared that, although the number of candidates for night schools had increased considerably, the quality of the work done had deteriorated. The number of failures to pass the examinations was 15 per cent. higher than last year. The answers to Scripture questions showed a fair knowledge of the subject; there was nothing calling for special note in arithmetic; the English grammar papers were not satisfactory; about half the papers in composition were "fair, though scanty;" the writing from dictation was in most cases correct; with two or three exceptions, the papers in English history were very unsatisfactory. One of the examiners strongly recommended the managers of schools to allow no youth to study any other subject for examination until he was thoroughly grounded in spelling and English grammar by means of dictation, parsing, &c. He doubted, in fact, whether it was advisable to allow any other subject to be offered to the candidate till he had passed an examination in reading, writing, and arithmetic. From the visitors' report it appeared that nineteen night schools were connected with the union, and that the number of persons attending them was 1,052.—After the approval of the reports, and a few observations having been made upon them, votes of thanks were passed to Lord Lyttelton, president; Mr. J. R. Chance, treasurer; by the Rev. Mr. Newbolt, and others. Lord Lyttelton was requested to continue to fill the office of president during the ensuing year, and his lordship consented to do so.—Mr. Stokes moved that action be taken to obtain exemption of Institution buildings from taxation. He said that as the law stood at present literary and scientific societies were exempt from taxation, except in certain cases, but the exceptions were such that the moment the societies became useful they were liable to be taxed. If any person resided on the premises, if payment was received for instruction, if payment was received for admission to lectures, in either of these cases the societies were liable to taxation. He commented upon the absurdity of taxing an Institution that would otherwise be exempt merely because some person remained on the premises to take care of the valuable property upon them, and said it was impossible to educate the people without receiving small payments both for class instruction and for admission to lectures.—Lord Lyttelton said he was not before aware of the existence of the exemptions spoken of by Mr. Stokes, but now that they were made known to him it certainly appeared that the intentions of the legislature were nullified by them. It must be borne in mind, however, that there was doubtless something to be said in favour of them or they would not have been made. He suggested that a deputation should be appointed to wait upon the Chancellor of the Exchequer. It was then resolved that the Association should take measures for obtaining exemption.—The Rev. Mr. Sandford moved that in future, as the Society of Arts did not examine in Scripture, a prize be offered by the South Staffordshire Association for the Promotion of Adult Education, to Society of Arts candidates, for proficiency in this branch of knowledge—the result of examination not to affect the candidate in his examination by the Society of Arts.—The motion was agreed to.

At half-past two an Educational Conference was held, and a number of subjects were discussed, amongst which was the subject of "Working Men's Clubs—how far they have been successfully tried in this district, and their adaptation to the necessities of the class for which they are intended."—The Rev. H. Solly, Secretary of the Working Men's Club Union, London, was the first speaker. He said it was hoped that working men's clubs would have the effect of attracting men at length to Mechanics' Institutes and working men's colleges. They were intended to be common grounds upon which working men could meet their friends and amuse themselves, and where they could improve their minds by study. At present if they wanted to see their friends they had no place to go to but to public-houses, and there they had to pay heavily, and become demoralised. Friendly and other societies now meeting at public-houses actually were put to so great an expense as 25 per cent. of their whole expenditure, on account of meeting at public-houses.—The Rev. George Boyle, of Handsworth, gave a very satisfactory account of the experience he had had in his parish.—The Rev. Mr. Sandford, in the course of a few observations, spoke of the admission of young men to working men's clubs, and said it was found to be injurious to the club to admit them.—The Rev. H. Solly said he knew that several clubs entirely failed on account of admitting young men.—Mr. J. A. Langford gave an account of the Working Men's Club in Newhall-street, Birmingham, and said the object of the Committee was to obtain light, warmth, and cheerfulness. As to the subject of beer, they did not mention it at all, but did not introduce it, and they thereby got over a great difficulty. It was found that twopence per week from each member, with the profits accruing from the sale of refreshments, was sufficient to pay all expenses. 500 cups of tea and coffee were sometimes sold in an evening, and the club was doing a great amount of good. It was expected that there would, in a short time, be three other clubs in Birmingham, each with 500 members. A piano was about to be introduced, the Mayor of Birmingham having already given a donation of £20 towards the purchase of it. —The Rev. D. Melville moved, "That in the opinion of this Conference the movement establishing working men's clubs and institutes deserves the cordial support of all classes, and it is trusted that the friends of education, as well as of the moral elevation and happiness of the working classes in this district, will endeavour to assist in their formation and establishment."—Mr. Sampson Lloyd seconded the motion, and it was agreed to.—Mr. Barnett Blake, Yorkshire Union of Institutes, feared that working men's clubs would decline as soon as they ceased to be a novelty. He feared they would not be self-supporting, and if they were not they would be a failure. He commended the course taken by the Birmingham committee in not mentioning beer or spirits at all in connection with the club. The majority of working men would not expect beer or spirits at their clubs if they were not suggested to them; but the absolute prohibition of them awakened that principle of perversity which has so much to do in swaying the human mind under certain circumstances.—The Chairman (Lord Lyttelton) said he quite agreed with Mr. Blake, that unless working men's clubs were self-supporting they would be failures—that was, self-supporting as to their ordinary current expenditure. It was quite right and proper that in every neighbourhood the little capital necessary for starting should be provided by the wealthier classes; but if anything beyond this was required, it could only be because the clubs were not in demand by the working classes. It was a great mistake to lay down a positive restriction of intoxicating liquors; in his opinion this was unfair treatment of the working classes. That they should not have their beer or whatever they wanted was what no one had a right to say to them, unless it were in accordance with the feeling of the best judging and most reasonable amongst the working classes themselves. He entirely approved of the working classes laying the restriction on themselves, and should be rejoiced to know that they did so, and admitted that it was quite expedient that they should be advised to do so. But what was it but a sign of the inferiority of the working classes to forbid them to have their spirits or beer? The publicans on the whole were the enemies of the working man—that could not be denied, and, generally speaking, they were very great nuisances to the working classes. This was often enough proclaimed; but why did not people say that the hotels of the upper classes, and the houses of entertainment of the middle classes were nuisances? He believed it might have been said with truth years ago; but nobody ever hinted now that hotels were nuisances to the morals of the middle classes. As we had seen an improvement in these respects in the upper and middle classes, so we should, he hoped, soon see a corresponding improvement in the lower classes. He never should be content till he saw that improvement, and until the time when the working classes could be trusted. One of the speakers had mentioned that some members wished to dance at a certain working men's club. There was no reason why the fact should be concealed that the Working Men's Institution at Worcester failed, after a certain number of years, because of the scandal caused by its weekly dancing meetings. When the working men could not be trusted to hold such meetings, it was a sign that they were inferior in the matter of self-control. Unless it was said that dancing was essentially evil, the prohibition of it to the one class, whilst it was permitted to another, showed that the one class was considered inferior to the other in morality, self-respect, and self-control. It was questioned whether smoking ought to be allowed in working men's clubs, and whether it should be permitted in the common room or be confined to a smoking-room. Now he (Lord Lyttelton) might be said to be biased upon this subject, for he had, personally, a great dislike to smoking, but in this case he thought all that was necessary was to avoid excess, which was doubtless highly injurious. The general principles upon which working men's clubs were advocated and founded he entirely approved of, and he hoped that those who had the conduct of the clubs would try with the utmost care and vigilance to conduct them wisely.

Papers were read upon the subjects of "Penny Entertainments and Cheap Concerts," and "Night Schools."

There was not time to discuss the subject of "Science Classes," which was on the paper. At five o'clock the President and Delegates, and others present, dined at the Dartmouth Hotel; at six o'clock the night school candidates had tea in St. George's Hall; and, at half-past-six there was a *soirée* and general meeting in the St. George's Hall, in connection with the Young Men's Christian Institution.

Lord LYTTELTON, the President, at half-past 7 o'clock, went to St. George's Hall, in company with a number of the clergymen and gentlemen who were present at the meeting in the morning; and having taken the chair, he delivered an address to the ladies and gentlemen present, who were so numerous as to fill the hall both on the floor and in the galleries. His lordship said he rejoiced there were a large number of certificates and other prizes to be distributed. He should have very considerable pleasure in giving away those prizes and certificates. They represented a large increase in the work of the Association. The distribution of prizes would alone occupy a great deal of the time of the meeting, so that in the observations which he was about to make he should not dwell upon any general principles connected with Associations of that kind, but he should have to notice some particular events connected with the Association during the past year. There had been events in connection with the Institution which were of a highly-favourable and gratifying character; and if he dwelt for a moment upon one of a very different kind, it was because it was better, upon an occasion like this, to get a subject of melancholy reflection out of the way, to leave space for the business that it was necessary to transact during the evening. In the first place he wished to advert to a heavy loss which the Association had sustained during the past year. There was not one connected with the South Staffordshire Association for Promoting Adult Education, and more especially was there not one upon the committee of that Association, who would not deeply regret the death, in New Zealand, of one of the most faithful and assiduous members of the committee, the Rev. Mr. Campbell, late of the Endowed School of Wolverhampton, in which town he was known and respected for many years before he was connected with the South Staffordshire Association. He could not but advert to this subject, as it was one which was uppermost in his mind, as he was sure it was in that of everyone connected with the Association. The tenets of religion only were capable of imparting any degree of satisfaction under such melancholy circumstances. He was glad of the opportunity thus incidentally afforded him to speak of religion in connection with that Institution. There could be no greater mistake than to suppose that because the conduct of that institute and that of similar ones had no direct connection, practically speaking, with religion, the subject ought to be totally excluded from view on an occasion like that. None of them, he was very certain would consent to have to do with the affairs of an institution which excluded the concerns of religion, even though it was excluded on account of the peculiar circumstances of the country, unless they were allowed to take it into account when looking at affairs in a comprehensive way. The direct concerns of religion were necessarily excluded because all classes were to be included; and there was necessarily a very great difference of opinion upon the subject of religion, and there was in the mind of every one a most earnest adhesion to his own form of belief. Therefore it was inevitable either that the institution must fail or that it must exclude all direct reference to religion. It was desirable on all proper occasions to show that institutions of that kind were in danger of arrogating to themselves more than they ought to do. They were in danger of supposing that they were to undertake in a full and complete sense the conduct of the moral and social progress of those with whom they had to deal, whereas they ought to consider that they were to act rather as handmaids than as leading powers, and to bring up those committed to their care to that state of enlightenment and understanding and right feeling in which they would be most susceptible of the higher influences of religion. Many things were needful for the welfare of the mind, but the communication of religious knowledge was the most important of all, and the danger was that that would be neglected. That was the only point of a general nature upon which he (Lord Lyttelton) wished to touch that evening. He trusted that the ministers of religion of all denominations whose co-operation the Association had the advantage of having, would never lose sight of the important matter to which he alluded. He did not speak with indifference of the religious distinctions amongst them. If they could be regarded with indifference, they ought not to exist; but as against ignorance, vice, and evil, the exertions of every Christian minister were welcome. He hoped the managers of the Association would, without hesitation, adhere to that one practical principle, to which he believed the institution owed whatever measure of success it had had. The most powerful instrument by which the objects and intentions of the association might be made known through the district was a living agent—a man whose main business should be to make known the existence and objects of the association, and to bring up to the level of its operations the population with which the society had to deal. Such an agent was obtained by the appointment of a gentlemen who was first known as organizing agent, who was now known as secretary, and who was looked to as the right hand of the Association. He did not intend to dilate upon the personal merits of Mr. Jones; he was thinking more of the principle upon which the appointment was made. He should not, however, for a moment make light of the eminent merits and qualifications which he believed Mr. Jones possessed for his office; he was satisfied that a better appointment could not have been made. An officer in the position of Mr. Jones must always be the mainstay of such an association. He had only to say of the report that, with one single and important exception, it was of a satisfactory and gratifying character. It was not to be doubted that, in many of the night schools of the district, much progress had been made; but yet, in the impartial report of the examiners a feeling of dissatisfaction and disappointment was expressed. But this ought not to discourage them; for he believed that the shortcomings of the night school candidates for certificates were due to the eagerness of the candidates and of the teachers to distinguish themselves. In the results of the examinations for the Society of Arts prizes; in the number of institutes which had joined the Union; in the number of candidates, and in the general extension, numerically speaking, of the operations of the society over the whole district, the report would show an increase and an improvement; and if so he should feel sanguine as to the good which institutions of that kind would effect. The progress might be slow, and might not be perceived at once, nor in quiet times; but in a crisis it would be more apparent than if it could be tested and gauged from year to year. It was an improvement of this kind, so slow that it was not perceived, that had resulted in the incomparable conduct of the suffering people of the North of England in their recent distress. Such conduct as theirs would have been unthought of under such circumstances 40 or 50 years ago; and who could doubt that the knowledge they had obtained, and the intellectual training they had undergone, imperfect as they were, had had a great part to play along with other and even higher influences, in producing that remarkable improvement in their conduct? In that district (South Staffordshire), a great improvement was visible. The people were more ready to avail themselves of opportunities for intellectual cultivation and moral improvement. In these respects the association felt comfort and satisfaction in looking back at what had been done and forward to what they hoped to do. His lordship concluded with a eulogy upon the Society of Arts, hoping that it would for a long time perform to a great extent for the middle classes the same functions which were performed for the higher classes by the two ancient and other universities. The South Staffordshire Association intended therefore to maintain and strengthen its connection with the Society of Arts.—Mr. ROBINSON read an abstract from the report of the Christian Institute, West Bromwich. The object of this institute is to provide for the mental, moral, and spiritual condition of young men. It seeks to do this by means of the delivery of practical addresses on the great questions of life, by lectures, classes, and a carefully selected library. A large number of young men are connected with the Institute, and it is doing a great deal of good in West Bromwich.—A large number of prizes and certificates were then distributed by Lord Lyttelton amongst the successful Society of Arts candidates, and the successful candidates from night schools, evening classes, &c.—Sir THOMAS PHILLIPS moved a resolution to the effect that the continued experience of the operations of the South Staffordshire Association for the Promotion of Adult Education, having fully demonstrated its usefulness in promoting the efficiency of the various educational Institutions in union, it is deserving of that liberal amount of public support by which alone it can be maintained; and in the course of his address he alluded to the slow rate of mental and moral progress as a consoling fact for those who occasionally felt discouraged at the smallness of the results which they could see their work produce. He also gave various details about the Society of Arts examinations, and concluded by wishing every success to the Association.—Mr. James CHANCE seconded the resolution. He had once been rather doubtful whether there was need for such an Association as the one under whose auspices they had met; but those doubts had now been completely removed, and he most heartily commended the scheme to the support of the employers of labour in the district, in order that its usefulness might be still further extended.—Rev. H. SOLLY and Mr. BARNETT BLAKE then addressed the meeting on working men's clubs and institution work, and after the usual thanks to the chairman, the proceedings terminated.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, September 25th*, 1863.]

Dated 16th September, 1863.

2271. B. Latchford, Upper St. Martin's-lane—An improved spur.
2272. B. J. Webber, Newton Abbot, Devonshire—Imp. in threshing machines.
2273. R. Thomson, Manchester—An improved mixed fabric, and in the application thereof to covering umbrellas and parasols.
2274. E. Scott, Manchester, and J. Starkey, Salford—Certain imp. in looms for weaving.
2275. R. Harrington, Birmingham—Imp. in umbrellas and parasols, and in parts thereof.
2276. J. M. Tate, Bermondsey Wall, Bermondsey—An improved method of hanging the lower topsail yards of ships and other sailing vessels.

[*From Gazette, October 2nd*, 1863.]

Dated 5th June, 1863.

1401. A. Q. de Gromard, Paris—Imp. in musical instruments.

Dated 25th June, 1863.

1605. H. C. Lee, Lawrence Pountney-lane—Imp. in the construction of sewing machines. (A com.)

Dated 4th August, 1863.

1924. E. A. Cotelle, 29, Boulevart St. Martin, Paris—A new method of manufacturing gas alcohol by means of diluted acids acting indefinitely without re-concentration.

Dated 12th August, 1863.

1989. L. R. Bodmer, 2, Thavies-inn—An improved mode and apparatus for dressing and finishing and for imparting lustre to yarn and thread made of silk, cotton, and other fibrous substances. (A com.)
1995. R. S. Newall, Gateshead, Durham—Imp. in apparatus for serving ropes for ships' rigging and other purposes.

Dated 13th August, 1863.

1998. C. C. Dennett, Nottingham—An improved method of fire-proof construction for buildings by the use of arches formed of concrete.

Dated 15th August, 1863.

2030. J. Grantham, 31, Nicholas-lane, City—Imp. in apparatus for manufacturing salt.

Dated 24th August, 1863.

2091. H. Batt, 21, Charlton, King's-road, Kentish Town—Imp. in roughing horses without taking off the shoe.
2096. F. R. Stack, Belgrave-villa, Finchley—Imp. in the construction of military bridges, piers, landing stages, and escalading apparatus.

Dated 27th August, 1863.

2121. G. Richards, 2, Caroline-street, Bedford-square—Imp. in the construction of ordnance and fire-arms, and in the projectiles to be used therewith.

Dated 28th August, 1863.

2127. L. A. Mulet, 1, Rue St. Charles, in the Thernes, Paris—An improved method of shoeing horses, and covering the feet or hoofs of other domestic animals with hardened india-rubber, gutta percha, and other improved similar materials.

Dated 29th August, 1863.

2137. W. Whitworth and J. Wrigley, Sowerby-bridge, near Halifax—Imp. in or applicable to the furnaces of steam boilers.

Dated 2nd September, 1863.

2169. R. Sims, Leigh, Lancashire—Imp. in reaping and mowing machines.

Dated 3rd September, 1863.

2174. A. L. Durand, 10, Rue de la Fidelite, Paris—Certain imp. in in the manufacture of nails and other similar articles.

Dated 4th September, 1863.

2183. C. Thornhill, Sheffield—A new or improved method of adapting steel or other suitable metallic wire to be used instead of animal bristles or hair, in sewing boots, shoes, saddlery, and leather works generally.
2184. C. G. Kelvey and W. Holland, Rock Ferry, Cheshire—Imp. in the construction of chronometers and other time keepers.
2185. J. Hendry and W. Coutts, Aberdeen—Imp. in furnaces.

Dated 7th September, 1863.

2198. J. B. York, Coleshill, Warwickshire—Imp. in privies or closets to be used in place of water closets.

Dated 8th September, 1863.

2211. J. D. Jack, Montrose—Imp. in moulding or shaping metals.

Dated 9th September, 1863.

2214. J. Lille and J. H. White, Manchester—An improved composition or coating for the protection and preservation of surfaces of iron, wood, and other materials.
2215. W. H. Hawksworth, Oldham, Lancashire—Certain imp. in apparatus for preparing cotton and other fibrous materials for spinning.

Dated 10th September, 1863.

2229. J. H. Wilson, Liverpool—Imp. in side lights for ships and other navigable vessels, and in the manufacture of the same.

Dated 14th September, 1863.

2253. H. Riviere, 19, Queen's-road, Bayswater—Imp. in the construction and application of apparatus and implements used for the purposes of heating, cooling, and evaporating.
2256. W. E. Gedge, 11, Wellington-street, Strand—Imp. in safety lamps for mines. (A com.)

Dated 16th September, 1863.

2264. J. Fox, Derby—Imp. in machinery for planing or cutting off the sides of armour plates.
2265. A. Fleming, Glasgow—Imp. in cutting or finishing matting and similar fabrics, and in the machinery used therefor.
2266. G. Lewal, 5 and 6, Philpot-lane—An improved method of, and apparatus for, consuming smoke, and heating and warming public and other buildings, and for drying purposes generally.

Dated 17th September, 1863.

2277. J. McEwen, Lay's Foundry, near Brierley-hill, Staffordshire—A new or improved combined coke oven and hot blast oven or apparatus.
2278. Z. J. Mercier, 50, Rue de Longchamp, Chaillot, Paris—An improved gas cock of elastic and continuous pressure.
2279. W. E. Gedge, 11, Wellington-street, Strand—Improved instruments for ascertaining levels, also for computing angles. (A com.)
2281. A. Chaplin, 24, Cheyne-walk, Chelsea—Imp. in apparatus for propelling ships or vessels.
2282. P. Cowan, Barnes, Surrey—An imp. in refining sugar.
2283. F. De Wylde, Trinity-square, Tower-hill—Imp. in the manufacture of an hydrated silica.

2284. R. A. Brooman, 166, Fleet-street—Imp. in taps. (A com.)

2286. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in life belts and swimming belts. (A com.)

2287. P. McLaurin, Glasgow—Imp. in drying paper, pasteboard, and similar fabrics, and in the machinery, apparatus, or means employed therein.

2289. J. Whitehead, Calverley, near Leeds—Imp. in pneumatic motive power machinery.

Dated 18*th September*, 1863.

2290. J. Allen, Manchester—Imp. in the construction of valves and cocks for steam, water, gas, and other fluids.

2291. J. Roberts and R. Naylor, Manchester—Imp. in increasing, diminishing, or otherwise regulating the power and tone of organs, harmoniums, pianofortes, or other instruments with similar keys or keyboards.

2292. R. D. Dwyer, Warrington, Lancashire—Improved apparatus for cleaning and painting or coating the bottoms of ships and other structures.

2293. G. Davies, 1, Serle-street, Lincoln's-inn—Imp. in the manufacture of iron and steel, and in the apparatus to be employed in such manufacture. (A com.)

2294. W. Lorberg, Wyld's-rents, Bermondsey—Imp. in the treatment of rags, and obtaining valuable chemical products from the animal fibre therein.

2295. I. Baggs, Cambridge-terrace—Imp. in the means of protecting and preserving the hulls and bottoms of ships and vessels from fouling and corrosion.

2296. A. Noirot, 61, Rue Pigaile, Paris—New tiles.

2297. J. M. Cook, Leicester—Imp. in railway carriages and all other springed vehicles.

2208. R. A. Brooman, 166, Fleet-street—An improved thread for fishing nets. (A com.)

2299. H. W. Hart, Fleet-street.—An imp. in T fastenings.

2301. A. V. Newton, 66, Chancery-lane—An imp. in propelling vessels, and in apparatus relating thereto. (A com.)

2302. W. Smith, 19, Salisbury-street, Strand—Imp. in constructing breech-loading ordnance. (A com.)

2303. W. Smith, 19, Salisbury-street, Strand—Imp. in the construction and mode of working ordnance for ships and forts, and in the means of protecting those engaged in working guns employed for such purposes. (A com.)

2304. T. Small, Bargate, Boston, Lincolnshire—Imp. in motive-power machinery.

2305. V. Houghton, Grove House, West Reading—Imp. in lamps and lamp wicks. (Partly a com.)

Dated 19*th September*, 1863.

2307. J. Buckley, Lees, Yorkshire—Certain imp. in mules for spinning cotton and other fibrous substances.

2309. R. Couchman, Noble-street, St. Martin's-le-Grand—Imp. in articles or instruments for supporting, holding, or carrying parasols, bags, watches, ornaments, or other articles or appendages.

2310. C. L. Fleischmann, 18, Rue Moncey, Paris—Imp. in machinery or apparatus for ginning cotton, also for cleaning, opening, and preparing cotton, wool, and other fibrous substances.

2311. B. Davis, Brettle-lane, and W. Bowler, Wall-heath, Staffordshire—An improved mode of strengthening tilt hammers.

2312. J. C. Pooley, George-street, Bath—Imp. in brewing or preparing beverages from malt and hops.

2313. J. P. B. Le Paturel, Piette House, Guernsey—Imp. in breech-loading fire-arms.

2315. T. Richardson, Newcastle-upon-Tyne, J. J. Lundy, Leith, N.B., and R. Irvine, Magdalen Chemical Works, Midlothian—Imp. in the extraction or manufacture of oils from vegetable substances.

2316. H. Bateman, Castlenau, Barnes, Surrey—An improved construction of rotary engine.

2317. T. E. Vickers, Sheffield—An imp. in the manufacture of cast steel tyres. (A com.)

Dated 21*st September*, 1863.

2319. E. F. Battier, 82, Boulevart Sebastopol, Paris—Imp. in crinolines.

2321. W. B. Robins, Harborne, Staffordshire—Imp. in portable fire and garden engines.

2322. A. A. Downes, Stonnall, Staffordshire—Imp. in artificial teeth.

2323. E. Alcan, King-street—Imp. in shears for cutting metal threads, wires, and rods, applicable also for guaging wires. (A com.)

2324. E. Alcan, King-street—Imp. in condensers applicable to wool carding engines. (A com.)

2325. F. A. Chatel, 29, Boulevart St. Martin, Paris—Imp. in burners for burning all mineral oils. (Partly a com.)

2326. R. Wallis, Basingstoke—Imp. in apparatus for loading and unloading vessels, and raising, lowering, and otherwise conveying sacks, casks, agricultural produce and other objects from one locality to another.

2327. R. Ridley, Leeds, and J. G. Jones, Cumming-street, Pentonville—Imp. in apparatus for giving a reciprocating motion to picks and cutting tools used in getting coals and other minerals and stone.

2328. G. T. Bousfield, Loughborough-park, Brixton—Imp. in power looms for weaving hair cloth and fabrics in which the weft is inserted in separate lengths of material. (A com.)

2330. W. Hutchinson, 26, Rue Notre-Dame-des-Victoires, Paris—Imp. in machinery for manufacturing moulded articles of india rubber. (A com.)

2331. T. B. Daft, Harlesden, Middlesex—Imp. in the construction of ships and vessels, and in sheathing the same.

2332. W. A. V. Kanig, Bedford-place, Russell-square—Imp. in railway telegraphs and signals, and also in the permanent way and carriages, for preventing railway accidents.

Dated 22*nd September*, 1863.

2333. J. Renshaw and J. Haworth, Manchester—Imp. in machinery for stretching woven fabrics.

2335. P. Effertz, Manchester—Imp. in machinery or apparatus for making bricks, tiles, pipes, and other similar articles.

2336. C. Maitland, Alloa, Clackmannan, N.B.—Imp. in mashing apparatus.

2337. J. Bond and J. Bond, Longridge, near Preston—Imp. in brick and tile making machinery, applicable also to machinery for manufacturing other articles from plastic materials.

2339. J. Brigham and R. Bickerton, Berwick-on-Tweed—Imp. in reaping or mowing machines.

Dated 23*rd September*, 1863.

2340. W. Cleninson, Ashton-under-Lyne—Imp. in the construction of pipe wrenches.

2341. J. Platt, 33, Argyle-street, St. Pancras—Imp. in machinery applicable to steam and water engines (as motors), which machinery is also applicable to lift and force pumps.

2343. W. Galloway and J. Galloway, Manchester—Imp. in lubricating journals of revolving shafts and axles, and in the apparatus employed for that purpose.

2344. E. T. Hughes, 123, Chancery-lane—Imp. in gas condensors. (A com.)

2345. W. Gibbs, and J. Holland, Eccles, Lancashire—Imp. in looms for weaving.

2346. W. T. Eley, Gray's-inn road—Imp. in the manufacture or construction of ball cartridges.

2347. A. Collingridge, 82, Cheapside—Imp. in the manufacture of casks and other receptacles for containing oil, petroleum, and other liquids.

2348. J. Phillips, Tollington-road, Holloway—Imp. in the construction of levels, applicable to levelling, surveying, astronomical, nautical, and other instruments or purposes to which levels are applicable.

Patents Sealed.

[*From Gazette, October 2nd*, 1863.]

2nd October.

864. F. C. Bakewell.
865. B. Cooper.
870. J. Burwin.
872. J. Swinburne & J. Stanley.
874. A. C. Bamlett.
878. R. A. Brooman.
879. R. A. Brooman.
889. W. H. Mitchell.
890. J. L. Norton.
891. A. Kinder.
896. G. Spencer.
907. T. Baldwin.
908. S. Shelmerdine and J. Dransfield.
910. R. Smith.
916. J. Lockwood.
923. C. A. Collins.
925. J. Gill.
927. R. Leggett and R. Gittus.
942. J. Smith.
947. H. A. Bonneville.
948. A. Marriott.
953. T. B. E. Fletcher.
995. W. C. Cambridge.
1011. W. Clark.
1013. P. McGregor.
1034. J. Dunbar, jun., and J. W. Woodford.
1336. A. Poirrier and C. Chappat, jun.
1042. W. E. Newton.
1070. R. Butterworth.
1072. G. E. Donisthorpe.
1073. H. Y. D. Scott.
1085. H. W. Ripley.
1086. M. Henry.
1234. V. J. Cassaignes.
1264. P. Addington.
1425. W. E. Newton.
1454. C. L. Van Tenac.
1464. W. Sims.
1543. T. Smith, T. Moore, and M. Burrell.
1613. R. Mushet.
1701. G. Haseltine.
1748. J. Laing.
1846. M. Meisel.
1980. A. V. Newton.
1987. R. Mushet.
1988. J. Cornforth & A. Andrews.
2034. G. T. Bousfield.

Patents on which the Stamp Duty of £50 has been Paid.

[*From Gazette, October 6th*, 1863.]

28th September.

2398. W. E. Newton.
2935. J. A. Fanshawe and J. A. Jacques.

29th September.

2469. G. T. Bousfield.

30th September.

2370. C. H. Hurst, H. Horsey, and G. Baker.

1st October.

2384. G. Rhodes and J. Syme.
2390. J. Bower and D. F. Bower.
2438. J. Calkin.

2nd October.

2397. J. W. Greaves.
2425. W. Yates.

3rd October.

2411. W. MacNaught.

Patents on which the Stamp Duty of £100 has been Paid.

[*From Gazette, October 6th*, 1863.]

29th September.

2476. W. E. Newton.

3rd October.

2320. D. O. Boyd.